

## § 89.402

exhaust gases receive specific component analysis determining concentration of pollutant, exhaust volume, the fuel flow (raw analysis), and the power output during each mode. Emissions are reported as grams per kilowatt hour (g/kW-hr).

(c) Requirements for emission test equipment and calibrating this equipment are found in subpart D of this part.

[59 FR 31335, June 17, 1994. Redesignated and amended at 63 FR 56995, 57015, Oct. 23, 1998]

### § 89.402 Definitions.

The definitions in subpart A of this part apply to this subpart. For terms not defined in this part, the definitions in 40 CFR part 86, subparts A, D, I, and N, apply to this subpart.

[63 FR 57015, Oct. 23, 1998]

### § 89.403 Symbols/abbreviations.

(a) The abbreviations in § 86.094-3 or § 89.3 of this chapter apply to this subpart.

(b) The abbreviations in Table 1 in appendix A to subpart D also apply to this subpart. Some abbreviations from § 89.3 have been included for the convenience of the reader.

(c) The symbols in Table 2 in appendix A to subpart D apply to this subpart.

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### § 89.404 Test procedure overview.

(a) The test consists of prescribed sequences of engine operating conditions to be conducted on an engine dynamometer. The exhaust gases, generated raw or dilute during engine operation, are sampled for specific component analysis through the analytical train. The test is applicable to engines equipped with catalytic or direct-flame afterburners, induction system modifications, or other systems, or to uncontrolled engines.

(b) The test is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide, oxides of nitrogen, and particulate matter. For more information on particulate matter sampling see § 89.112(c). The test cycles consist of various steady-state operating modes that include different

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combinations of engine speeds and loads. These procedures require the determination of the concentration of each pollutant, exhaust volume, the fuel flow (raw analysis), and the power output during each mode. The measured values are weighted and used to calculate the grams of each pollutant emitted per kilowatt hour (g/kW-hr).

(c)(1) When an engine is tested for exhaust emissions, the complete engine shall be tested with all emission control devices installed and functioning.

(2) On air-cooled engines, the fan shall be installed.

(3) Additional accessories (for example, oil cooler, alternators, or air compressors) may be installed but such accessory loading will be considered parasitic in nature and observed power shall be used in the emission calculation.

(d) All emission control systems installed on or incorporated in the application must be functioning during all procedures in this subpart. In cases of component malfunction or failure, maintenance to correct component failure or malfunction must be authorized in accordance with § 86.094-25 of this chapter.

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### § 89.405 Recorded information.

(a) The information described in this section must be recorded, where applicable, for each test.

(b) *Engine description and specification.* A copy of the information specified in this paragraph must accompany each engine sent to the Administrator for compliance testing. The manufacturer need not record the information specified in this paragraph for each test if the information, with the exception of paragraphs (b)(3) and (b)(9) of this section, is included in the manufacturer's application for certification.

(1) Engine-system combination.

(2) Engine identification numbers.

(3) Number of hours of operation accumulated on engine.

(4) Rated maximum horsepower and torque.

(5) Maximum horsepower and torque speeds.

(6) Engine displacement.

(7) Governed speed.

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- (8) Idle rpm.
- (9) Fuel consumption at maximum power and torque.
- (10) Maximum air flow.
- (11) Air inlet restriction.
- (12) Exhaust pipe diameter(s).
- (13) Maximum exhaust system backpressure.
- (c) *Test data; general.* (1) Engine-system combination.
- (2) Engine identification number.
- (3) Instrument operator.
- (4) Engine operator.
- (5) Number of hours of operation accumulated on the engine prior to beginning the warm-up portion of the test.
- (6) Fuel identification.
- (7) Date of most recent analytical assembly calibration.
- (8) All pertinent instrument information such as tuning, gain, serial numbers, detector number, and calibration curve numbers. As long as this information is available for inspection by the Administrator, it may be summarized by system number or analyzer identification numbers.
- (d) *Test data; pre-test.* (1) Date and time of day.
- (2) Test number.
- (3) Intermediate speed and rated speed as defined in § 89.2 and maximum observed torque for these speeds.
- (4) Recorder chart or equivalent. Identify the zero traces for each range used, and span traces for each range used.
- (5) Air temperature after and pressure drop across the charge air cooler (if applicable) at maximum observed torque and rated speed.
- (e) *Test data; modal.* (1) Recorder chart or equivalent. Identify for each test mode the emission concentration traces and the associated analyzer range(s). Identify the start and finish of each test.
- (2) Observed engine torque.
- (3) Observed engine rpm.
- (4) Record engine torque and engine rpm continuously during each mode with a chart recorder or equivalent recording device.
- (5) Intake air flow (for raw mass flow sampling method only) and depression for each mode.

- (6) Engine intake air temperature at the engine intake or turbocharger inlet for each mode.
- (7) Mass fuel flow (for raw sampling) for each mode.
- (8) Engine intake humidity.
- (9) Coolant temperature outlet.
- (10) Engine fuel inlet temperature at the pump inlet.
- (f) *Test data; post-test.* (1) Recorder chart or equivalent. Identify the zero traces for each range used and the span traces for each range used. Identify hangup check, if performed.
- (2) Total number of hours of operation accumulated on the engine.

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### § 89.406 Pre-test procedures.

- (a) Allow a minimum of 30 minutes warmup in the standby or operating mode prior to spanning the analyzers.
- (b) Replace or clean the filter elements and then vacuum leak check the system per § 89.316(a). Allow the heated sample line, filters, and pumps to reach operating temperature.
- (c) Perform the following system checks:
  - (1) Check the sample-line temperatures (see § 89.309(a)(4)(ii) and (a)(5)(i)(A)).
  - (2) Check that the system response time has been accounted for prior to sample collection data recording.
  - (3) A hang-up check is permitted, but is optional.
  - (d) Check analyzer zero and span at a minimum before and after each test. Further, check analyzer zero and span any time a range change is made or at the maximum demonstrated time span for stability for each analyzer used.
  - (e) Check system flow rates and pressures.

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### § 89.407 Engine dynamometer test run.

- (a) Measure and record the temperature of the air supplied to the engine, the fuel temperature, the intake air humidity, and the observed barometric pressure during the sampling for each mode. The fuel temperature shall be less than or equal to 43°C during the sampling for each mode.